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THE EFFECT OF OVEN DRYING SPECIMENS ON UNIAXIAL ELASTIC PROPERTIES

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March 1983

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Ce document est le produit d'une numérisation par balayage de la publication originale.

(CANMET)

MICROMEDIA

11 pp

ENERGY RESEARCH PROGRAM
MINING RESEARCH LABORATORIES
DIVISION REPORT ERP/MRL 83-16(TR)

INTRODUCTION

As part of the mechanical rock properties investigation within the Canadian Nuclear Waste Management Program, a study has been conducted to determine if oven dried rock specimens yield significantly different results from air dried specimens in uniaxial testing. As a simple test, three lengths of core were cut from various depths of the URL 1 and URL 5 boreholes. Each length was divided into two samples, one of which was air dried and prepared for uniaxial compression testing while the other was oven dried before preparation. As a secondary study, the oven dried samples were stored in the open, weighed, dried and weighed again to determine the amount of moisture absorption.

IDENTIFICATION OF SPECIMENS AND TESTS

Mechanical property tests were conducted on six standard samples originating from boreholes URL 1 and URL 5. The samples are generally described as granitic (a more complete modal analysis may be found in Petrographic and Petrofabric Analysis of Extended Engineering Standard Samples from URL 1 and URL 5 by Wong, in preparation). Table 1 provides information on the dimensions, density and location of the six specimens. The following mechanical properties have been determined for the samples listed in Table 1:

1) Young's Modulus.
2) Poisson's Ratio.
3) Compressive Strength.

DESCRIPTION OF TEST MEASUREMENTS

For details on test procedure the reader is referred to Technical Data 303410-M01/78. The two Philips PR9302 Strain Bridges and the Mosely Autograph 2FRA X-Y recorder were replaced by two Bruel and Kjaer Type 1526 Strain Indicators and a Hewlett Packard 7046 B X-Y recorder to measure and record the axial and transverse strain. The oven dried samples were conditioned under vacuum at a heating rate of 0.3°C per minute or less. The temperature was held at 65°C for approximately three hours when the samples were removed and let stand for a week. They were then weighed and conditioned a

Table 1 - Dimensions and density of specimens

Specimen No.	Dimensions (mm)		Density*
	Length	Diameter	(gm/cc)
URL 1 283.800	97.62	44.84	2.63
URL 1 283.900	94.92	44.86	2.63
URL 5 129.300	97.14	45.00	2.63
URL 5 129.400	97.70	45.00	2.63
URL 5 134.800	95.00	45.00	2.63
URL 5 134.900	96.16	45.00	2.63

*No change in weight was observed after the second drying cycle.

second time for 24 hours, reweighed and prepared for testing. When not involved in preparation or testing, the specimens were stored in a dessicator.

DATA SUMMARY

Table 2 summarizes the conditioning, uniaxial compressive strength and elastic properties determined for the six samples. Figure 1 through 6 are the axial and transverse stress-strain curves from which the elastic properties were calculated. The final load value on the specimen was used to determine the uniaxial compressive strength. The sample weights were equal (to 0.01 gram accuracy) before and after the second drying cycle.

SUMMARY AND CONCLUSIONS

Three pairs of URL specimens were prepared for uniaxial testing, each pair representing core samples adjacent to one another in depth. One of the pair was prepared for testing after being air dried while the other was oven dried under vacuum.

The mechanical properties determined here fall well within the population of values found during previous testing of samples from the URL site (1,2). No significant differences in the Young's modulus were noted between the air dried and oven dried samples. Poisson's ratio and uniaxial compressive strength showed only the usual data scatter and no trend could be discerned reflecting the effect of oven drying.

Table 2 - Summary of conditioning uniaxial compressive strength and elastic property data of specimens

Specimen No.	Conditioning	Young's modulus (GPa)	Poisson's ratio	Uniaxial compressive strength (MPa)
URL 1 283.800	air dried	60.24	0.19	192
URL 1 283.900	oven dried	60.24	0.23	187
URL 5 129.300	air dried	66.23	0.30	200
URL 5 129.400	oven dried	66.67	0.24	198
URL 5 134.800	air dried	67.11	0.23	190
URL 5 134.900	oven dried	63.69	0.25	203

ACKNOWLEDGMENT

The author would like to acknowledge Evan Noden for his contribution to the testing program.

REFERENCES

1. Jackson, R. "Dilatational velocity, Young's modulus, Poisson's ratio and uniaxial compressive strength for URL-2 and URL-5 samples"; Division Report ERP/MRL 82-60(TR); CANMET, Energy, Mines and Resources Canada; 1982.

2. Jackson, R. "Dilatational velocity, Young's modulus, Poisson's ratio, uniaxial compressive strength and Brazilian tensile strength for URL-1 and URL-5 extended engineering samples"; Division Report ERP/MRL 82-61(TR); CANMET, Energy, Mines and Resources Canada; 1982.

Fig. 1 - Axial and Circumferential stress strain curves for URL 1 283.800

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Fig. 2 - Axial and circumferential stress strain curves for URL 1 283,900

Fig. 3 - Axial and circumferential stress strain curves for URL 5 129.300

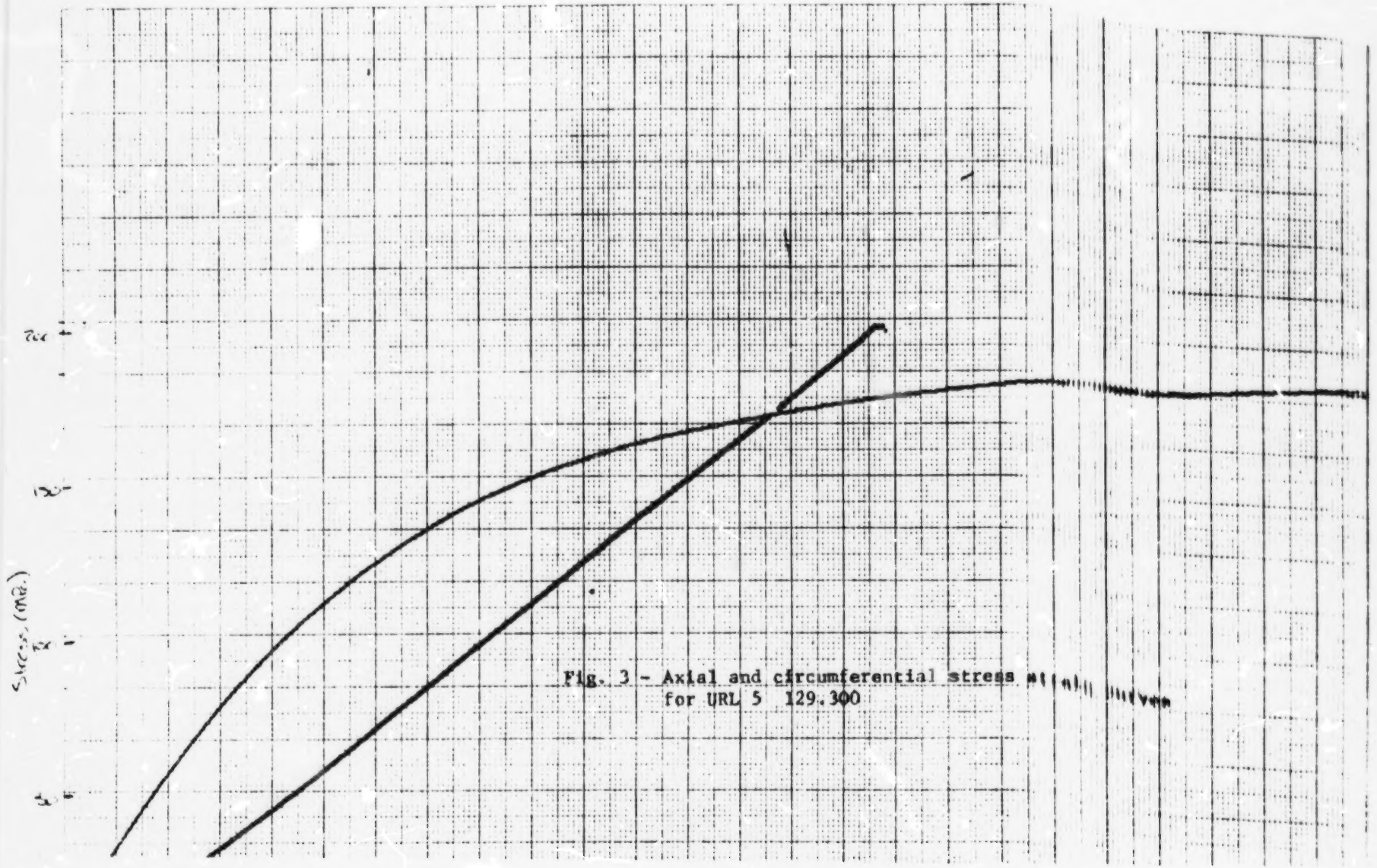

Fig. 3 - Axial and circumferential stress [illegible]
for URL 5 129.300

Fig. 4 - Axial and circumferential stress strain curves for URL $ 129.400

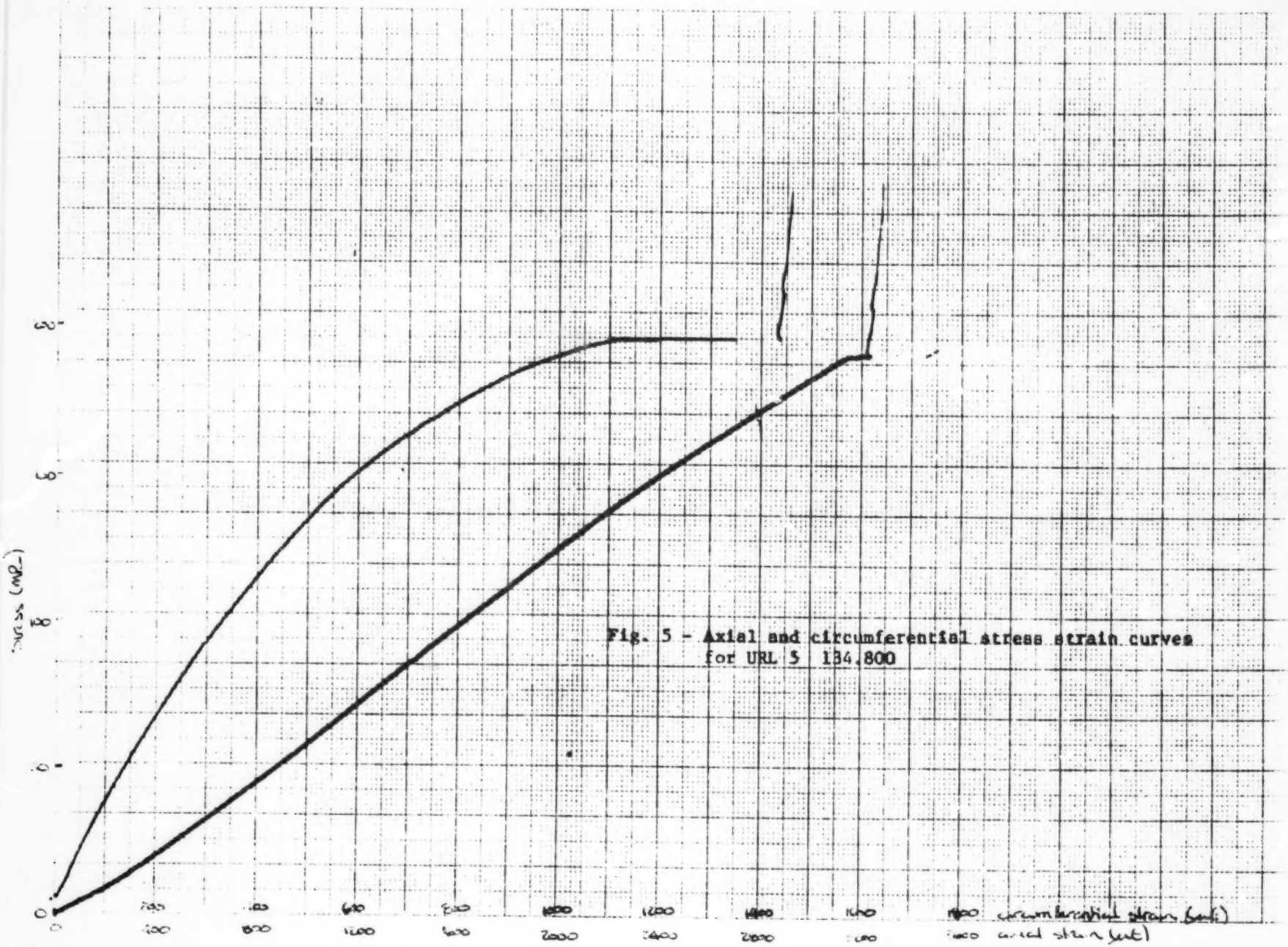

Fig. 5 - Axial and circumferential stress strain curves for URL 5 134.800

Fig. 6 - Axial and circumferential stress strain curves for URL 5 134-900